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"Studies on Freshwater Decapods in Latin America"
Ingo S. Wehrtmann & Raymond T. Bauer (Guest Editors)
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Research Article

Species diversity and distribution of freshwater crabs (Decapoda: Pseudothelphusidae) inhabiting the basin of the Rio Grande de Térraba, Pacific slope of Costa Rica

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ABSTRACT. During the last decades, knowledge on biodiversity of freshwater decapods has increased considerably; however, information about ecology of these crustaceans is scarce. Currently, the freshwater decapod fauna of Costa Rica is comprised by representatives of three families (Caridea: Palaemonidae and Atyidae; Brachyura: Pseudothelphusidae). The present study aims to describe the species diversity and distribution of freshwater crabs inhabiting the basin of the Rio Grande de Térraba, Pacific slope of Costa Rica, where the Instituto Costarricense de Electricidad (ICE) plans to implement one of the largest damming projects in the region. Samples were collected in 39 locations at an altitude ranging from 20 to 1,225 m. Sampling was carried out during several months in 2007, 2009 and 2010. We collected a total of 661 crabs, comprising eight species of Pseudothelphusidae of three genera, representing 53% of the 15 pseudothelphusid crab species currently recorded from Costa Rica. The most common species was *Ptychophallus paraxanthusi* followed by *P. tristani*. Freshwater crabs were more frequently encountered in the middle-low region of the basin (between 311 and 600 m) and less frequently in the medium-high basin (between 601 and 1,225 m). *Ptychophallus paraxanthusi* showed the widest distribution and was collected in altitudes ranging from 20 to 700 m. The Rio Grande de Térraba region can be considered as a relatively small, but highly diverse system. Therefore, any alteration of the basin of Rio Grande de Térraba, and especially the possible construction of a hydroelectric power plant, needs to be carefully analyzed to mitigate the damaging effects of this project on the freshwater crabs. More ecological information about freshwater crabs from Costa Rica and the Central American region are needed to reach a first reasonable overview on the ecological role of these decapods in freshwater systems.

Keywords: Crustacea, river crabs, faunal survey, species diversity, Central America.

Diversidad de especies y distribución de cangrejos de agua dulce (Decapoda: Pseudothelphusidae) de la cuenca del Río Grande de Térraba, vertiente Pacífica de Costa Rica

RESUMEN. El conocimiento de la biodiversidad de decápodos de agua dulce ha aumentado considerablemente durante las últimas décadas. Sin embargo, información sobre la ecología de estos crustáceos es limitada. Actualmente, la fauna de los decápodos de agua dulce está compuesta por representantes de tres familias (Caridea: Palaemonidae y Atyidae; Brachyura: Pseudothelphusidae). El presente estudio describe la diversidad de especies y la distribución de cangrejos de agua dulce de la cuenca del Río Grande de Térraba, vertiente Pacífica de Costa Rica, donde el Instituto Costarricense de Electricidad (ICE) está planeando construir una de las plantas hidroeléctricas más grandes de la región. Las muestras fueron recolectadas en 39

localidades a una altitud entre 20 y 1.225 m. El muestreo se efectuó durante varios meses de los años 2007, 2009 y 2010. Se colectó un total de 661 cangrejos de ocho especies de Pseudothelphusidae de tres géneros, lo que representa un 53% de las 15 especies de Pseudothelphusidae actualmente reportado para Costa Rica. La especie más frecuentes fue *Ptychophallus paraxanthusi*, seguida por *P. tristani*. Los cangrejos de agua dulce fueron más frecuentes en la región medio-baja de la Cuenca (entre 311 y 600 m) y menos frecuentes en la región medio-alta (entre 601 y 1.225 m). *Ptychophallus paraxanthusi* demostró la distribución más amplia y fue colectado en altitudes entre 20 y 700 m. Se puede considerar el Río Grande de Térraba un sistema pequeño, pero altamente diverso. Por lo tanto, cualquier alteración de la Cuenca del Rio Grande de Térraba, y especialmente la posible construcción de la planta hidroeléctrica, requiere un análisis cuidadoso para mitigar efectos dañinos de este proyecto sobre los cangrejos de agua dulce. Se requiere más información ecológica sobre los cangrejos de agua dulce de Costa Rica y la región de Centro América para obtener una primera visión razonable del rol ecológico de estos decápodos en los sistemas dulceacuícolas.

Palabras clave: Crustacea, cangrejos de agua dulce, inventario faunístico, diversidad de especies, América Central.

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INTRODUCTION

Knowledge and literature about the taxonomic diversity of decapod crustaceans has increased considerably during the last decades (Ng *et al.*, 2008). Most of these publications focused on decapods inhabiting marine ecosystems; however, there has been also a significant increase in studies concerning freshwater decapods, including representatives of the two families of Brachyura from the neotropical region (among others, Magalhães, 2003a, 2003b; Rodríguez & Magalhães, 2005; Magalhães & Türkay, 2008a, 2008b; Yeo *et al.*, 2008; Cumberlidge *et al.*, 2009; Pereira *et al.*, 2009; Villalobos & Alvarez, 2010). Currently, there are approximately 6,800 valid species of brachyuran crabs and about 1,300 (19.4%) of these have been reported from freshwater habitats (Ng *et al.*, 2008; Yeo *et al.*, 2008).

The taxonomic composition of the freshwater decapod fauna of Costa Rica is fairly well known and is composed by three families: Palaemonidae and Atyidae (Caridea), and Pseudothelphusidae (Brachyura). The latter includes the freshwater crabs, a very diverse group, which is currently comprised by 40 genera and roughly 255 species and subspecies in the neotropics (Rodríguez & Magalhães, 2005). Of these, a total of 15 species of four genera can be found in Costa Rica (C. Magalhães *et al.*, unpublished data.). The vast majority of the studies on freshwater crabs in Costa Rica concerns taxonomic aspects (Rathbun, 1893, 1896, 1898, 1905; Smalley, 1964; Bott, 1968; Pretzmann, 1965, 1972, 1978, 1980; Villalobos, 1974; Rodríguez, 1982, 1994, 2001; Rodríguez & Hedström, 2000; Hobbs III, 1991; Magalhães *et al.*, 2010). Apart from these, there are just two publications concerning their ecology: one study on the distribution of *Potamocarcinus nicaraguensis* in the basins of the rivers San Carlos and Sarapiquí, northern Costa Rica (Villalobos & Burgos, 1975), and one report on the offspring production and juvenile occurrence of *Potamocarcinus magnus* in the Costa Rican territory (Wehrtmann *et al*., 2010).

Detailed information about species diversity and ecological features of the freshwater decapods fauna is of special importance when evaluating the possible environmental impacts, which may be caused by the construction of dams for hydroelectric plants (Holmquist *et al*., 1998; Benstead *et al*., 1999; March *et al*., 2003; Greathouse *et al.*, 2006). The Instituto Costarricense de Electricidad (ICE) is planning to construct, in the southern Pacific lowlands, one of the largest hydroelectric plants in Central America (ICE, 2009). Lara & Wehrtmann (2011) already analyzed the species composition of river shrimps in this area and recommended the incorporation of structures permitting the passage of the migrating shrimps to mitigate negative effects of the construction of the hydroelectric power plant. Therefore, the present study aimed to amplify the existing information about the freshwater fauna in the study area and to provide basic information on the species diversity and distribution of freshwater crabs inhabiting the area (basin of the Rio Grande de Térraba), where the ICE plans to implement one of the largest damming projects in the region.

MATERIALS AND METHODS

Study area

The study was carried out in the Rio Grande de Térraba basin, provinces of San José and Puntarenas, Pacific slope of Costa Rica (Fig. 1). The basin is the largest in the country and covers an area of 5,085 km^2;

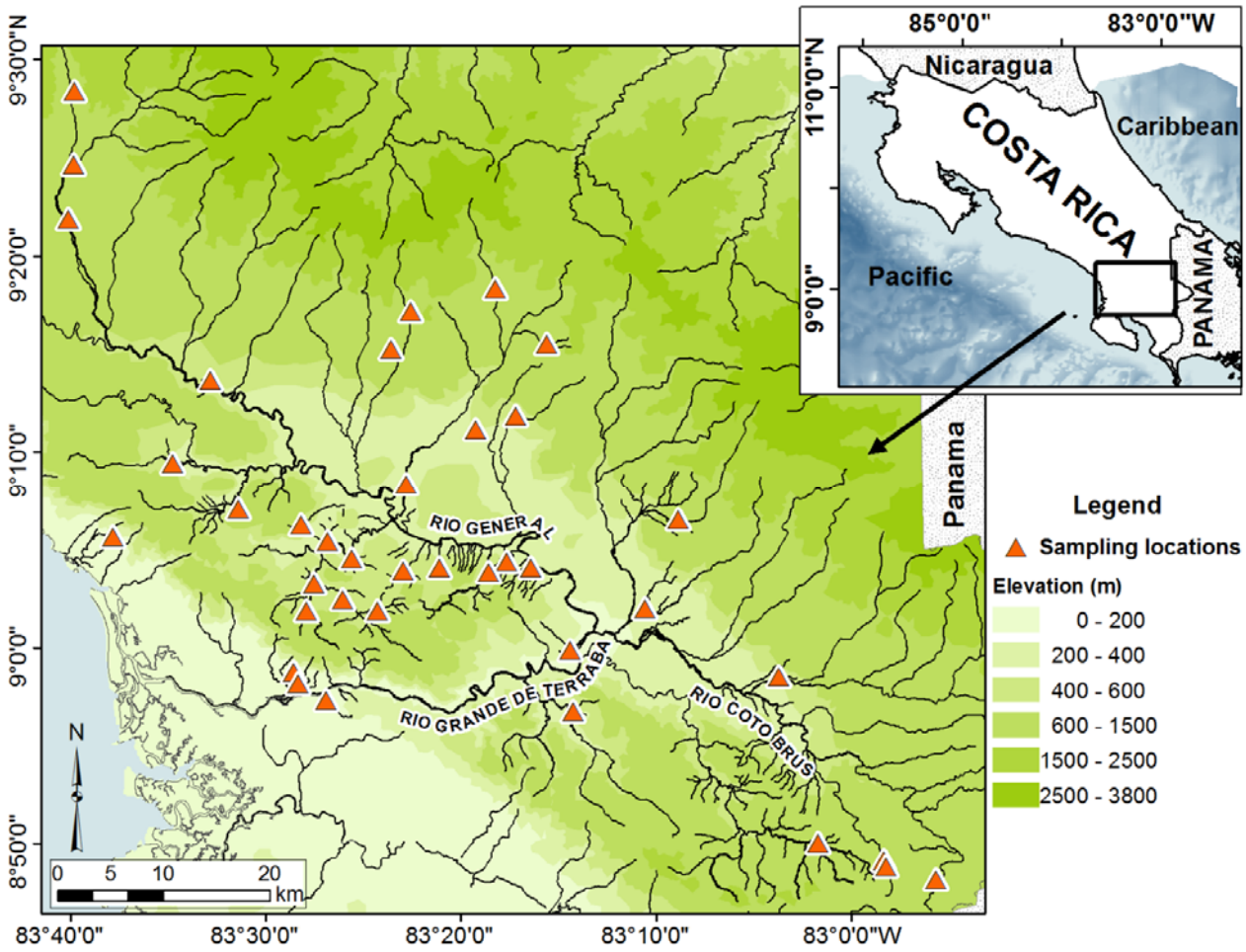

Figure 1. Location of sampling sites in the Rio Grande de Térraba basin, provinces of San José and Puntarenas, Pacific slope of Costa Rica, between April 2007 and April 2010.

its rivers have a total length of 4,997 km (TNC, 2009). The principal tributaries are the Rio General and the Rio Coto Brus, which drain into the Rio Grande de Térraba; the discharge of this river (recorded at a station located at an altitude of 60 m above sea level) varies between 100 (dry season) and 1,050 m^3 s^{-1} (rainy season) (ICE, unpublished data). The drainage area is comprised by numerous other tributary streams originating in the Cordillera de Talamanca at altitudes of up to 3,820 m and is characterized by the formation of a low altitude mountainous ridge, which is oriented parallel to the Pacific coast (TNC, 2009). A description of physical and chemical parameters and the benthic diversity as indicator of the environmental quality of the Rio Grande de Térraba and some tributaries have been presented by Umaña-Villalobos & Springer (2006). The area has been characterized by a constantly growing human population, accompanied by strong deforestation, especially in its lower regions (Umaña-Villalobos & Springer, 2006), which is also critical for the hydropower sector of Costa Rica (Leguía *et al.*, 2008). The hydroelectric project El Diquís contemplates the construction of a retaining dam, located 4 km upstream of the bridge over the Rio General, at the locality of El Brujo; the base of the dam will be located at 140 m above sea level, and the reservoir will have an area of 6,815 hectares with an installed capacity of 631 megawatts (MW) (ICE, 2009).

Sampling

The study is based upon exhaustive sampling carried in 39 locations at altitudes (expressed as m above sea level) between 20 and 1,225 m along the entire basin (Fig. 1). Samples were taken in April 2007 through July 2007, between October and November 2009, and in April 2010. In order to describe the presence of each species and its distribution in the study area, the

sampling locations were categorized according to its altitude: 1) lower basin (between 20 and 310 m above sea level; n = 12 sampling sites); 2) middle-low basin (between 311 and 600 m above sea level.; n = 14); 3) medium-high basin (between 601 and 1,225 m above sea level.; n =13). In each location, sampling was carried out during daytime (typically between 08:00 and 14:00 h) and lasted between 60 and 90 min. In search of crabs, we lifted rocks directly in or closely to the water body of rivers and streams. In some cases, the stream course was temporarily bypassed to drain a small part of the river or creek, which allowed observations below the rocks in the riverbed. The manually collected individuals were brought to the nearby laboratory in Cajón de Boruca and stored in a freezer for further analysis. At each sampling location, water temperature and dissolved oxygen were measured (YSI Model 85), to obtain information about the environmental conditions where each of the crab species was captured. The catch-per-unit-effort (CPUE) represents the number of crabs divided by the sampling effort (number of visits in each sampling location). The CPUE was related to the altitude of the sampling site, and a linear correlation was applied to analyze the possible correlation between the two variables.

The collected individuals were identified at the species level using descriptions provided by Smalley (1964), Villalobos (1974), Rodríguez (1982, 1994, 2001); Rodríguez & Hedström (2000), and Magalhães *et al*. (2010). Each crab was sexed, and recorded its wet weight (digital balance; Snowrex BBA-600; ±0.01 g), carapace width (CW; distance across the carapace at its widest point), carapace length (CL; distance along the midline, from the frontal to the posterior margin of the carapace) utilizing a digital vernier (Stanley; ± 0.01 mm). Voucher specimens were deposited in the crustacean collections of the Museo de Zoología, Universidad de Costa Rica, and the Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil.

RESULTS

Freshwater crabs were easier to encounter in creeks with low river discharge (<1 m^3 seg^{-1}) and with a river substrate composed of numerous broken rocks of different sizes (immature alluvial deposits consisting of angular grains of short transport) in areas covered by rich vegetation, providing abundant shading from canopy cover. Several crabs were collected outside the water, mainly under damp or wet rocks and crevices. The sampling locations where crabs were found were well-oxygenated river sections with dissolved oxygen values varying between 5.8-8.7 mg L^{-1} and water temperatures ranging from 19.0 to 28.9ºC (Table 1).

A total of 661 freshwater crabs were collected during the study period in the basin of the Rio Grande de Térraba. Of these, 309 (47.7%) were females, 319 (48.3%) were males, and the sex of 33 (4%) specimens could not be identified. No ovigerous females were encountered; however, two specimens, collected in the Rio Reventazón (305 m above sea level; 23 May 2007), and in an unnamed tributary of the Rio Ceibo (900 m above sea level; 17 July 2007) carried juveniles under the abdomen. All specimens belonged to Pseudothelphusidae, represented by three genera and eight species (Table 1). *Ptychophallus* was the genus with the highest number of species encountered (5 spp.), followed by *Allacanthos* (2 spp.) and one species of *Potamocarcinus*. This is the first report of *Ptychophallus colombianus* and *P. uncinatus* from [?] Costa Rica. Taxonomic diversity increased with altitude: the lower basin harbored two crab species, the middle-low basin five species, and the medium-high basin six species.

The most frequently collected species was *P. paraxanthusi* followed by *P. tristani* (Fig. 2). In contrast, *P. tumimanus* was encountered exclusively in one location (creek Veraguas of the sub-basin of Rio Concepción). There was no significant relationship between the CPUE and altitude ($r = -0.16$; $P = 0.30$). However, freshwater crabs were more frequently encountered in the middle-low region of the basin (between 311 and 600 m above sea level) and less frequently in the medium-high basin (between 601 and 1,225 m above sea level).

Only two crab species (*P. paraxanthusi* and *P. uncinatus*) were found in the lower portion of the river basin, and *P. paraxanthusi* was by far the most common species in this section. However, the catch frequency of these two species was higher in this river section compared to the medium-high basin, where six species were found.

The crab species with the widest distribution within the basin of the Rio Grande de Térraba was *P. paraxanthusi* (collected in altitudes ranging from 20 to 700 m above sea level) (Fig. 3), followed by *P. tristani*, which was encountered exclusively in tributaries of the Cordillera de Talamanca in altitudes between 410 and 1,105 m above sea level. Other two species, *P. tumimanus* and *P. colombianus*, were caught in one single sampling location (creek Veraguas and a nameless tributary of the river Buena Vista, respectively), at 335 and 1,225 m above sea level, respectively (Fig. 4).

Table 1. Species list of freshwater crabs collected during 2007 and 2010 in the Rio Grande de Térraba basin, Pacific slope of Costa Rica, indicating wet weight, size (all individuals per species), number of locations where the species was collected, and environmental conditions for each of the species encountered. CL: carapace length, CW: carapace wide.

Species	Range of wet weight (g)	Range of CL (mm)	Range of CW (mm)	Number of collection places	Range of altitude (m)	Range of water temperature (°C)	Range of dissolved oxygen (mg L^{-1})
Allacanthos pittieri (Rathbun, 1896)	0.8-4.9	11.0-16.6	15.6-28.8	3	900-1000	nd	nd
Allacanthos yawi Magalhães *et al.* (2010)	0.2-4.3	7.1-16.3	10.4-28.5	2	920-1105	19.8-21.8	7.8-8.4
Potamocarcinus magnus (Rathbun, 1896)	0.1-47.6	7.5-39.2	9.9-59.6	3	380-900	22.3-25.4	7.4-7.7
Ptychophallus uncinatus Campos & Lemaitre, 1999	0.1-10.3	6.6-22.3	9.4-39.2	3	20-500	25.9-26.2	7.2-8.1
Ptychophallus colombianus (Rathbun, 1896)	0.2-7.7	7.3-20.8	11.9-35.2	1	1200*	19.0	8.7
Ptychophallus paraxanthusi (Bott, 1968)	0.1-42.9	3.7-37.7	5.6-62.8	26	20-715	22.6-26.9	6.9-8.7
Ptychophallus tristani (Rathbun, 1896)	0.1-12.5	3.4-22.9	4.6-38.3	8	410-1105	20.7-24.1	5.8-8.4
Ptychophallus tumimanus (Rathbun, 1898)	0.3-4.6	7.3-18.0	10.8-28.2	1	335*	23.2-28.9	7.5-8.8

* This species was collected in one single location.

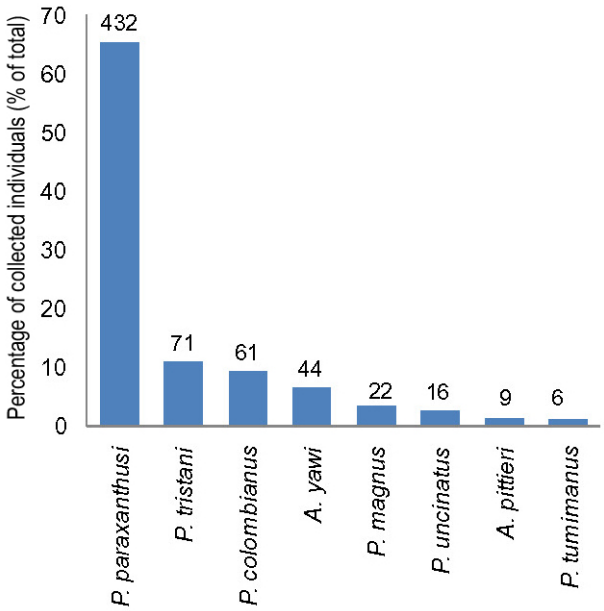

Figure 2. Percentage per species regarding the total number of collected individuals captured between April 2007 and April 2010 in the Rio Grande de Térraba basin, Pacific slope of Costa Rica. Numbers in top of each column indicate the number of individuals per species.

Among the collected species, *P. paraxanthusi* achieved the largest individual size (up to 62.8 mm CW), followed by *P. magnus* with a maximum CW of 59.2 mm. The smallest individual encountered collected belonged to *P. tristani* with a CW of 4.6 mm. Detailed information about the range of CL and CW for the species encountered is compiled in Table 1.

DISCUSSION

Species diversity

The results of the present study clearly demonstrate that the freshwater crab diversity of the basin of the river Grande de Térraba is considerably high: the eight species collected by us represent 53% of the 15 pseudothelphusid crab species currently recorded from Costa Rica (C. Magalhães *et al*., unpublished data). Rodríguez & Hedström (2000) revised a small collection of freshwater crabs from the Barbilla National Park, Atlantic slope of Costa Rica, and reported two species, *P. magnus* and *P. barbillaensis*. These results, as well as the fact that only seven out of 15 crab species reported from Costa Rica (C. Magalhães *et al*., unpublished data) occur at the Atlantic side of Costa Rica, seem to indicate higher crab diversity in freshwater habitats along the Pacific slope of the country. However, so far no exhaustive sampling efforts have been carried out to document the freshwater crab diversity at the Atlantic slope of Costa Rica, which may partly explain the difference of crab species encountered in the Pacific and Atlantic slopes of the country.

When compared to Central America, our relatively small study area harbors 18% of all pseudothelphusid crab species so far reported from the region (Rodríguez & Magalhães, 2005), which highlights the ecological importance of the Rio Grande de Térraba basin for the diversity of the freshwater decapods in Costa Rica and Central America. However, the lack of similar studies impedes any valid comparison of the freshwater crab species diversity within the Central American region.

There exists some scattered information about the freshwater crab diversity in South America, which may serve as guideline for comparison with the results of the present study. Magalhães (2002) assessed the decapod fauna of two rivers, which form part of the Rio Madeira basin, Bolivia. He reported the presence of four freshwater crab species, all of them belonging to the family Trichodactylidae. In another study, Magalhães (2003b) revised collections obtained in the middle and lower Rio Xingu, southern tributary of the Amazon River, Brazil, and reported a total of five freshwater crab species from this river. Surveys of decapod fauna using the Aquatic Rapid Assessment Program (AquaRAP) protocol in some South American rivers resulted in four species of crabs (one Pseudothelphusidae and three Trichodactylidae) from the upper and middle Rio Caura, Venezuela (Magalhães & Pereira, 2003), five species (three Pseudothelphusidae, two Trichodactylidae) from the upper Rio Essequibo, Guiana (Lasso *et al.*, 2008), five species (two Pseudothelphusidae, three Trichodactylidae) from the upper Rio Cuyuní, Venezuela (Mora-Day *et al.*, 2009), four species (one Pseudothelphusidae, three Trichodactylidae) from Rio Pastaza, Ecuador and Peru (Magalhães, 2005), four species (two Pseudothelphusidae, two Trichodactylidae) from upper Rio Paragua, Venezuela (Mora-Day & Blanco-Belmonte, 2008), 12 presumptive species (eight Pseudothelphusidae, four Trichodactylidae) from river drainages of the Tumucumaque Moutains National Park, Brazil (Vieira, 2008), three species (one Pseudothelphusidae, two Trichodactylidae) from the confluence of the Rio Orinoco and Rio Ventuari, Venezuela (Pereira & García, 2006), and three species (one Pseudothelphusidae, two Trichodactylidae) from the middle Coppename River, Suriname (Pereira & Berrestein, 2006). According to Magalhães & Pereira (2007), the Guayana Shield region, including parts of Colombia, Venezuela, Brazil, Guyana, Suriname and French Guiana, harbors representatives of 33 species of

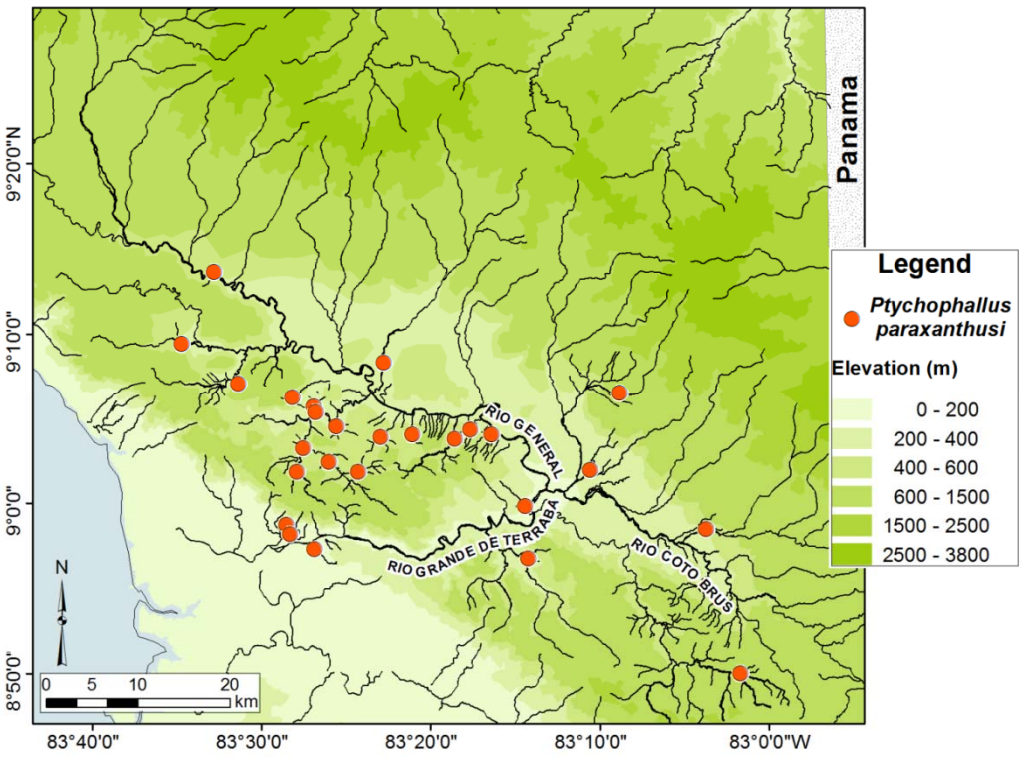

Figure 3. Locations where *Ptychophallus paraxanthusi* was collected in the Rio Grande de Térraba basin, Pacific slope of Costa Rica, visited between April 2007 and April 2010.

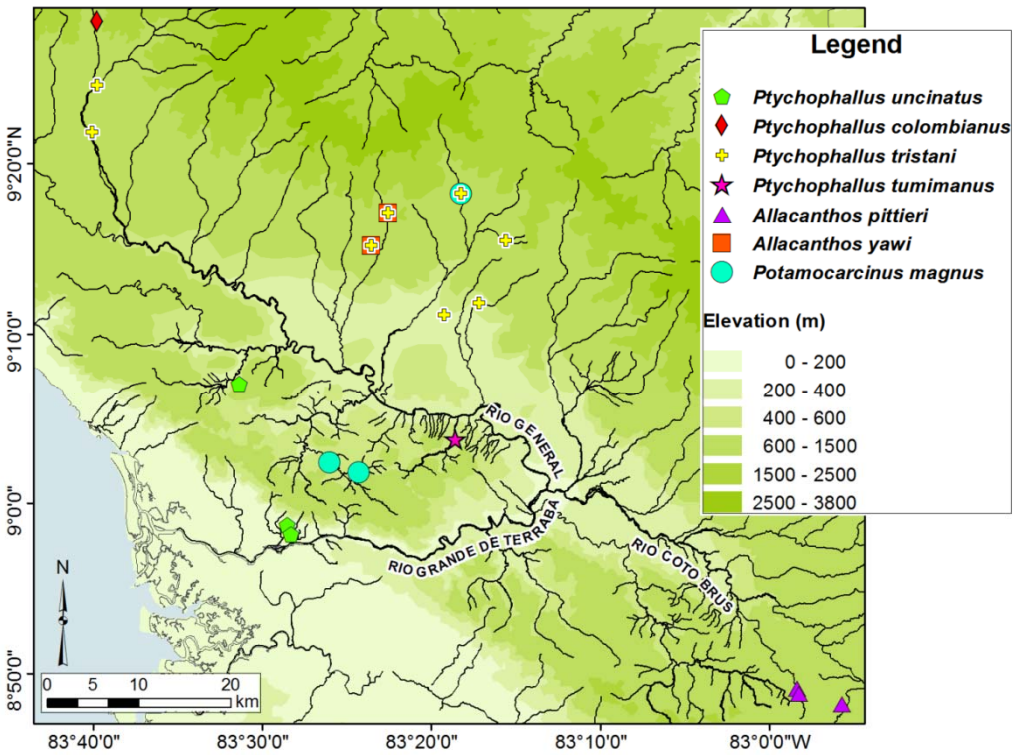

Figure 4. Sampling locations *Ptychophallus uncinatus*, *P. colombianus*, *Ptychophallus tristani*, *P. tumimanus*, *Allocanthos pittieri*, *A. yawi* and *Potamocarcinus magnus* in the Rio Grande de Térraba basin, Pacific slope of Costa Rica, between April 2007 and April 2010.

freshwater crabs: 21 species of Pseudothelphusidae and 12 species of Trichodactylidae. Similarly, Pereira *et al*. (2009) compiled the list of the decapod species from the Rio Orinoco basin, which drains large areas of the Guayana Shield and the Venezuelan Llanos in northern South America, and reported 16 species of pseudothelphusid and five species of trichodactylid crabs for the whole region. These comparisons, especially when taking into consideration the area covered by the above-mentioned studies, reveal that the Rio Grande de Térraba region, with its eight freshwater crab species, can be considered as a relatively small, but highly diverse system. Therefore, any alteration of the basin of the Rio Grande de Térraba, and especially the possible construction of a hydroelectric power plant, needs to be carefully analyzed to mitigate the damaging effects of this project on freshwater crabs (see Lara & Wehrtmann, 2011).

New geographical distribution

The results of the present study expand the known geographical distribution of *Ptychophallus uncinatus* and *P. colombianus*. The first species was recorded from Rio San Pedro, Bocas del Toro, Panama (Campos & Lemaitre, 1999) and from the Veragua Rainforest Research and Adventure Park, province of Limón, Costa Rica (C. Magalhães *et al*., unpublished data); both records are from the Caribbean slope of Costa Rica and Panama, and our results extend its distribution to the Pacific slope of Costa Rica. The presence of this species on both sides of Costa Rica may indicate the ability of *P. uncinatus* to cross the Central American cordillera; however, this species has been found only at altitudes below 500 m above sea level. Due to these circumstances, studies on the molecular genetics of both populations present on the Caribbean and Pacific slopes are in progress to verify whether we are dealing or not with the same species. In the case of *P. colombianus*, the species has been previously known only from Pacific Panama, and our results indicate its presence also in Pacific Costa Rica. This range extension is not surprising, considering that Chiriquí (Panama) and our study area belongs to the same cordillera (Talamanca). Moreover, the species has been encountered in a wide range of altitudes (from 1,220 up to 3,000 m above sea level; Rodríguez, 1994), which may facilitate its distribution along the Pacific slope of Central America.

Altitudinal distribution

Our knowledge about the altitudinal distribution of Central American freshwater crabs is generally limited to sporadic collections published in taxonomic studies (*e.g.*, Rathbun, 1898; Smalley, 1964). As far as we know, there are no published reports focusing on the ecology, including altitudinal distribution, of these freshwater crabs.

Allocanthos pittieri seems to be a species preferring higher altitudes, because we collected this species only between 900 and 1,000 m above sea level. This species was described by Rathbun (1898) from Agua Buena, Java, Province Puntarenas, Costa Rica, without mentioning the altitude where the specimens were obtained. *Allocanthos yawi* is a newly -described species (Magalhães *et al.*, 2010) found between 505 and 1,105 m above sea level (Table 1).

Our data concerning the altitudinal distribution of *P. magnus* (380-900 m; Table 1) are in the range of previous reports: Smalley (1964) found the species between 580-800 m above sea level, Rathbun (1896) between 800 and 1,000 m above sea level, and Rodríguez & Hedström (2000) encountered the species between 100 and 300 m above sea level. These data indicate that *P. magnus*, a species inhabiting both slopes of Costa Rica, can be found in a wide range of altitudes.

The altitudes where we collected *P. tristani* (410-1,105 m above sea level; Table 1) are similar to those reported in the literature: Smalley (1964) found the species between 580-1,200 m above sea level, Rathbun (1896) at 1,130 m above sea level, and Monge *et al.* (1985) at 700 m above sea level. It is concluded that *P. tristani* is a species preferring medium altitudes.

Previous records for *P. tumimanus* indicate its presence in relatively high altitudes (Rathbun, 1898: up to 1,500 m above sea level; Smalley, 1964: 1,200-1,300 m above sea level). In contrast, we collected the species only in one location at a considerably lower altitude (335 m above sea level; Table 1), which seems to indicate that *P. tumimanus* inhabits a wide range of altitudes.

Habitat

Detailed information about the habitat of freshwater crabs in Latin America is scarce and typically limited to general descriptions of the study area. In our study, crabs were encountered under angular rock fragments of short distance transport; these rocks may be located in the riverbed or in the shore close to the terrestrial zone, but always in humid ground. Water bodies with slow stream flow turned out to be good areas to collect freshwater crabs (see Smalley, 1964, for other *Ptychophallus* spp.). Freshwater crabs were also collected in shallow pools below logs, and in accumulations of leaves.

In the case of *P. colombianus*, we found the specimens in rapid streams descending from nearby mountains (*e.g.*, Rio Buena Vista), which is in agreement with habitat descriptions provided by Rodríguez (1994) for individuals collected in Panama. Smalley (1964) obtained *P. tristani* under rocks or tree trunks at the edge of streams, sometimes even in some distance from the stream edge. Crab burrows of this species might be located under rocks or logs and are filled with water (Smalley, 1964). These descriptions coincide with the habitat where we collected *P. tristani*.

Final remarks

The knowledge of freshwater communities contributes to resolve questions related to the evolution, speciation, and distribution of living organisms (Mossolin & Mantelatto, 2008). In particular, freshwater crabs may serve as research objects to understand the interesting evolutionary patterns along their distribution. However, much of the necessary biological information about these decapods is far from complete, and we need to improve our knowledge about freshwater crabs from Costa Rica and the Central American region to reach a first reasonable overview on the ecological role of these decapods in freshwater systems.

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